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PLANETARY PHENOMENA FOR JULY AND
AUGUST, 1903.

BY MALCOLM MCNEILL.

PHASES OF THE MOON, PACIFIC TIME.

First Quarter, July 1, 1 ^h 2 ^m P.M.	Full Moon, Aug. 8, 12 ^h 54 ^m A.M.
Full Moon, " 9, 9 43 A.M.	Last Quarter, " 15, 9 22 P.M.
Last Quarter, " 17, 11 24 A.M.	New Moon, " 22, 11 31 A.M.
New Moon, " 24, 4 46 A.M.	First Quarter, " 29, 12 34 P.M.
First Quarter, " 30, 11 15 P.M.	

The Earth is in aphelion on the evening of July 2d.

Mercury is not in very favorable position for naked-eye view during July and August. At the beginning of July it is a morning star, having passed greatest west elongation late in June, but the interval between the rising of the planet and sunrise is only a little more than one hour. The interval remains as great as one hour until about the middle of the month, and it is possible that the planet may be seen in especially good weather. After the middle of the month the planet rapidly approaches the Sun, and passes superior conjunction July 26th. Throughout August it is an evening star, and toward the close of the month it is nearly at its greatest east elongation, but the relatively great southern declination of the planet allows it to remain above the horizon less than an hour after sunset, and thus makes the conditions for visibility decidedly poor.

Venus is still an evening star, and reaches its greatest east elongation, $45^{\circ} 30'$, on July 9th; but after that its distance from the Sun diminishes very rapidly, and by the end of August it has nearly reached inferior conjunction. On July 1st it sets about 2^h 35^m after sunset, on August 1st, 1^h 45^m after, and on September 1st, only 22^m later. The planet is now in that part of its orbit farthest south of the ecliptic, and this contributes materially toward diminishing the interval between the setting of the Sun and of the planet. *Venus* will, however, come to its greatest brightness on August 12th, and for some weeks before and after that time will be visible in full sunlight, if one knows where to look for it. *Mercury* and *Venus* are in

conjunction on August 28th, with *Venus* a little more than 6° south of *Mercury*.

Mars is still in fair position for evening observation in the western sky. On July 1st it sets a little before midnight and two months later, on September 1st, it sets shortly after 9 o'clock. Its distance from us in millions of miles increases from 104, on July 1st, to 122, on August 1st, and 139, on September 1st, and in consequence its brightness diminishes more than fifty per cent during the interval; but it will still be bright enough to be rather conspicuous among the stars, and it will not be at all difficult to identify. Its motion among the stars during July and August is about 32° eastward and 13° southward from the western part of the constellation *Virgo* into *Libra*. On July 23rd it passes about three diameters of the Moon north of *Spica*, a *Virginis*. On July 1st it is in conjunction with the Moon, and on the evening of that day the Moon will pass just south of the planet. The planet will be occulted in countries farther south than the United States, and perhaps in the extreme southern parts of this country.

Jupiter is moving around toward a position favorable for evening observation. It rises shortly after 11 P. M. on July 1st, and by the end of August shortly after seven. It is in the constellation *Pisces*, and moves slowly eastward, about $15'$, until July 14th. It then begins to move westward, and by the end of August this retrograde motion amounts to about 3° . In its retrograde motion it follows a path a fraction of a degree south of its eastward path, and at the end of August its position is about the same as it was at the end of May.

Saturn is in good position for observation. It comes to opposition with the Sun on July 30th, and is consequently above the horizon nearly the entire night throughout the two months. It is in the constellation *Capricorn*, and moves about 5° westward during July and August. Both *Saturn* and *Jupiter* are in a region in which there are few bright stars.

Uranus is above the horizon until late at night, not setting until about 3:30 on July 1st, and shortly after 11 on September 1st. It moves westward until the end of August a little more than 1° in *Ophiuchus* between *Scorpio* and *Sagittarius*, but no bright star is near enough to afford an easy identification.

Neptune passed conjunction with the Sun late in June, and

is now a morning star, but until August it remains too near the Sun to be easily seen even with a good telescope.

August is the month for the *Perseid* meteors, and the watcher for them will be able to see a good many during any clear night, especially during the second week of the month.

AN APPLICATION OF THE CROSSLEY REFLECTOR
OF THE LICK OBSERVATORY TO THE
STUDY OF VERY FAINT SPECTRA.*

BY H. K. PALMER.

While engaged in photographing the brighter nebulae with the Crossley reflector, the late Professor KEELER noted the great relative photographic brightness of the central stars in the ring nebulae in *Lyra* and *Cygnus*—a fact indicating that the spectra of these stars contain an unduly large proportion of actinic rays. He tried to examine their spectra, both with a direct-vision spectroscope and with a prism held in the path of the rays, but in neither case was the spectrum bright enough to be seen. He therefore decided to construct a spectrograph for the study of these objects.

Such an instrument, to preserve and utilize the enormous advantages of the silver-on-glass reflecting telescope for work in the violet and ultra-violet regions, called for a design radically different from those of conventional spectroscopes. It would evidently be difficult for a star near the limits of vision to be centered and kept upon a narrow slit; the method of guiding by means of a reflecting slit would not answer; and it would be important to avoid the usual losses due to a slit. The instrument as originally designed consisted, in outline, of a 50° quartz prism with circular aperture of 27mm , placed directly in the converging beam of light from the great mirror, at a distance of 15cm inside the focus; of a plate-holder suitably placed; and of a guiding eye-piece working on the same principle as that employed in ordinary nebular photography.

Director KEELER had thought that by placing the prism

* Abstract from Lick Observatory Bulletin No. 34.